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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/995,222      | 11/27/2001  | Lars Langemyr        | 801939/111          | 9649             |

7590 12/26/2007  
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| EXAMINER |
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SHARON, AYAL I

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| ART UNIT | PAPER NUMBER |
|----------|--------------|

2123

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| MAIL DATE | DELIVERY MODE |
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12/26/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                               |                                 |  |
|------------------------------|-------------------------------|---------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>09/995,222 | Applicant(s)<br>LANGEMYR ET AL. |  |
|                              | Examiner<br>Ayal I. Sharon    | Art Unit<br>2123                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 September 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 September 2006 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Introduction***

1. Claims 1-56 of U.S. Application 09/995,222 filed on 11/27/2001 are presented for examination.

### ***Petition to Revive***

2. The petition to revive filed on 9/14/2007 was granted on 10/18/2007.

### ***Continued Examination Under 37 CFR 1.114***

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/14/2007 has been entered.

### ***Drawings***

4. This application has been filed with informal drawings that are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

***Claim Rejections - 35 USC § 101***

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. **Claims 1-56 are rejected under 35 U.S.C. 101 because the claimed invention preempts a 35 U.S.C. 101 judicial exception. The claims preempt every**

**“substantial practical application” of an idea – a mathematical algorithm.**

7. One may not patent every “substantial practical application” of an idea, law of nature or natural phenomena because such a patent “in practical effect be a patent on the [idea, law of nature or natural phenomena] itself.” Gottschalk v. Benson, 409 U.S. 63, 71-72, 175 USPQ 673, 676 (1972).
8. According to MPEP § 2106 (IV)(C)(3), a claim that recites a computer that solely calculates a mathematical formula (see Benson) or a computer disk that solely stores a mathematical formula is not directed to the type of subject matter eligible for patent protection.
9. All of the claims in the instant application share this defect. In particular, none of the independent claims are restricted to any field of application, and therefore the claims are directed to all possible applications of the math recited in the claims.
10. The independent claims recite “producing a model” where the model “represents a mathematical expression of the physical quantities of the combined physical system”, however, it is not clear from the claims what the “physical system” is.

11. Applicants' comments in the amendment filed 9/14/07 (see p.11) states that  
    "[s]uch systems can include geophysics, fluid flow, and other physical systems."
12. The specification further lists "Heat transfer" (see p.19), while the figures further list "AC Power Electromagnetics", and "Electrostatics", and other physical quantities of the combined physical system that can be modeled (see especially Fig.3, and p.18 of the specification).
13. The specification therefore recites a variety of unrelated practical applications for the claimed mathematical results of the "physical quantities of the combined physical system." The only commonality between these different "physical quantities of the physical system" is the underlying mathematics.
14. Applicants' claims therefore are directed exclusively to the mathematics, and lack any recitation of specific and substantial practical application. Examiner therefore has determined that the claims attempt to patent all "substantial practical applications" of the underlying mathematical algorithm. Thus, the claims are non-statutory.

***Indication of Allowable Subject Matter***

15. The following indicates how the claimed subject matter in independent claims 1, 14, and 27 overcomes the cited prior art. The claims are currently rejected under 35 U.S.C. § 101, and therefore are not currently allowable.
16. Claims 1 and 14 utilize "at least one non-local coupling" to determine a representation of a partial differential equation system. According to the

specification (see p.31 of the PG-PUB of the instant application: U.S. PG-PUB 2003/0105614; or see p.118 of the filed specification):

Variables in FEMLAB are generally evaluated locally their value at each evaluation point is computed using information only from their evaluation point. In contrast, the value of a *coupling variable* is the result of a computation carried out elsewhere in the geometry or even in another geometry altogether. When used in the PDE and boundary conditions, the result is the introduction of non-local dependencies – *extended* multiphysics - as opposed to ordinary multiphysics, which refers to dependencies between variables in [the] same geometric location.

The coupling variables are extremely powerful in their ability to make the values of an expression available non-locally. The coupling variables are not only useful for modeling coupled problems - they can also be used solely for post processing and visualization purposes.

All coupling variables are defined in two steps. First define the *source*, i.e., the domains in which the evaluation takes place, the name of that evaluation, and the name given to the resulting variable; secondly define the *destination*, i.e. the domains within which it is possible to use the resulting variable.

There are three kinds of coupling variables implemented: scalar, extrusion, and projection.

17. The FEMLAB® Reference Manual, Version 1.0 is dated July 1998. This

reference pre-dates the priority filing date of the instant application. It teaches:

- a. "The core of FEMLAB is a set of algorithms for discretizing and solving Partial Differential Equations (PDE)." (see pages 3-21 to 3-27. The quote is on page 3-21).
- b. The use of Dirichlet and generalized Neumann boundary conditions in the coefficient form of PDE (see page 3-23).

- c. The use of Jacobians to solve PDE in the coefficient form (see pages 3-26 to 3-27), and a non-linear solver for obtaining the Jacobians (see pages 3-60 to 3-66).
- d. The “weak form” (or “variational form”) of the differential of the partial differential equation (see pages 3-40 to 3-41).

18. The FEMLAB® Reference Manual, Version 1.0, however, does not teach the use of “at least one non-local coupling” to determine a representation of a partial differential equation system.

19. The “FEMLAB 2.2: New Features” article teaches (see p.2):

Automatic Jacobian computation for non-local couplings is now supported. You can access dependent variables non-locally, define scalar coupling variables by coordinate values or integration, and couple field variables by projection or extrusion.

The copyright date of this article is 2001, which post-dates the priority filing date of the instant application, and therefore does not qualify as prior art.

20. The FEMLAB® Installation and New Features Guide, Version 2.3 teaches that one new feature in Version 2.3 was “Improved contact problem handling using non-local coupling and nonlinear boundary conditions” (see page 6-41).

21. According to FEMLAB® Installation and New Features Guide, Version 2.3, printing history for the previous versions of the FEMLAB® Installation and New Features Guide is as follows:

- a. October 2000, First Printing, FEMLAB 2.0
- b. March 2001, Second Printing, FEMLAB 2.1

c. November 2001, Third Printing, FEMLAB 2.2

d. November 2002, Fourth Printing, FEMLAB 2.3

22. Therefore, FEMLAB® Installation and New Features Guide, Version 2.3 confirms that both FEMLAB versions 2.2 and 2.3 post-date the priority filing date of the instant application, and therefore do not qualify as prior art.

23. The Anderson reference, "Iterative Procedures for Nonlinear Integral Equations" teaches the use of strong local coupling (see p.548, para.4; and p.549, para.4), and the use of Jacobians (see p.549-551) for non-linear integral equations. However, Anderson does not teach the use of non-local coupling, nor does Anderson expressly teach that his methods apply to Partial Differential Equations (PDE).

### ***Response to Amendment***

#### ***Re: Claim Rejections - 35 USC § 101***

24. The Applicants arguments (dated 9/14/2007) regarding the 35 USC §101 rejections are unpersuasive. The 35 USC §101 rejections based on lack of a "concrete, useful, tangible result" have been replaced with 35 USC §101 rejections based on an attempt to claim all "substantial practical applications" of an idea.

### ***Conclusion***

25. Applicant's arguments filed 9/14/2007 have been fully considered but they are not persuasive.



***Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753.

Any response to this office action should be faxed to (571) 273- 8300, or mailed to:

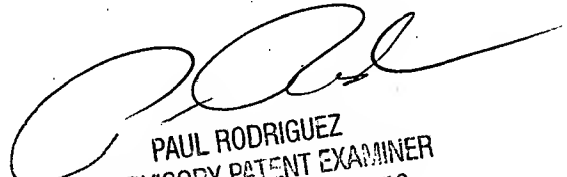
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P.O. Box 1450  
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or hand carried to:

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Randolph Building  
401 Dulany Street  
Alexandria, VA 22314

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon  
Art Unit 2123  
December 19, 2007

  
PAUL RODRIGUEZ  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2100